U.S. Fish & Wildlife Service

Exploring the Habitats of the Refuge

Fresh Water Tidal Marsh

Tidal Creek

Impoundment (Created Pond)

Woodlands Field

Five Habitats!

A Habitat is an area in which a specific plant or animal naturally lives, grows, and reproduces; an area that provides a plant or animals with adequate food, water, shelter, and living space.

One of the John Heinz National Wildlife Refuge at Tinicum's best features is that it is home to five discrete habitats (woodland, field, creek, pond, and marsh) in a relatively small area - a GREAT place to explore different habitats and the varied flora and fauna associated with each.

Your students can see Belted Kingfishers and American shad in the creek, white-tailed deer and cardinals in the woodlands, rabbits and butterflies in the fields, and Red-winged Blackbirds, Tree Swallows, herons and turtles at the pond. This diversity of life and habitat makes "Tinicum" a great natural area for student exploration.

The lessons in this packet are designed to focus your students on the diversity of life and habitat at the John Heinz National Wildlife Refuge at Tinicum.

Sincerely,

The Refuge Environmental Education Development (REED)Team

Table of Contents

The Five Habitats of Tinicum

First a little marsh history...

Though used by Native Americans in the area as a place to hunt and gather food, they had little permanent impact on the area. When Europeans settled the area in the 1600s, Tinicum marsh consisted of approximately 6,000 acres of freshwater tidal marsh. Europeans raised much of their food by farming. Diking, draining, and filling of the marshes began in order to create suitable farmland. Over time, the farms of the area were succeeded by homes and businesses. Today, the area once called “Tinicum” (islands of the marsh) by the Lenape tribe supports a Revolutionary War period fort, an international airport, and several boroughs and townships. The refuge was established to protect the remaining freshwater tidal marsh located along the Delaware River at the mouth of what is now called the Darby/Cobbs Creek watershed. Of the original freshwater tidal marsh approximately 250 acres remain within the 1,000 acre refuge. The remaining acres comprise the four other habitat types.

Freshwater Tidal Marsh

Tinicum Marsh is the largest remaining freshwater tidal marsh in Pennsylvania and is part of the Delaware **Estuary**. Marshes are important ecosystems for wildlife and people. A marsh is nursery, providing a shelter for insects, amphibians, birds, fish, and other wildlife, as well as feeding and nesting areas. Estuaries produce more **biomass** than the rainforests and support over 90% of the fishing industry. The marshes at Tinicum are responsible for refreshing underground **aquifers**. Furthermore, marshes can hold large quantities of water, reducing serious flooding and allowing the water table to remain stable in drought conditions by slowly releasing that water. Preserving marshes benefits people and wildlife.

Typical plants that can be found in Tinicum marsh include: cattails, arrow arum, wiild rice, spatterdock, marsh mallow, pickerelweed, and a variety of smartweeds. Two plants that are common but not native are purple loosestrife and phragmites. Animals using Tinicum’s marsh include: muskrat, wading birds (herons, egrets), waterfowl (ducks, geese), shorebirds (gulls, sandpipers), turtles (snapping, red-bellied, painted), as well as a variety of frogs and insects.

Tidal Creek

Darby Creek, which flows through the marsh, is tidal, with an average tide difference of five feet between high and low tide. Vegetation along the creek bank consists mostly of willow and alder trees, small shrubs, and herbaceous plants that have adapted to the changing water levels and assist in reducing streambank erosion. Common fish in the creek include carp, catfish, and small panfish. Kingfishers, wading birds like herons and egrets, ducks, and other waterfowl also use the creek.

Impoundment (Created Pond)

The 145-acre **impoundment**, which is a body of water created by diking, provides homes for many of the same plants and animals that are found in the marsh. Along with the animals already mentioned, a variety of birds, including gulls and swallows, may be seen around the impoundment area. Duckweed, purple loosestrife, cattails, and marsh mallow are some of the typical plants found in and around the impoundment. **Pond** studies may reveal snails as well as a variety of insect larvae and aquatic worms. Be on the look-out for Tree Swallows, Red-wing blackbirds, wading birds, Canada Geese, turtles, and carp. If you are really lucky you might see a Bald Eagle.

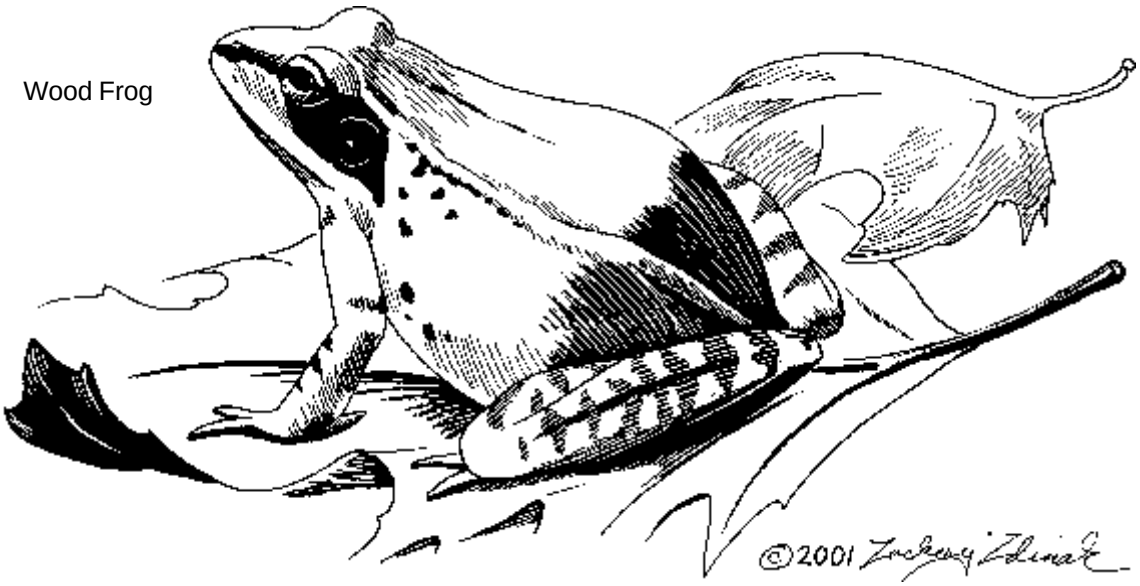
Woodlands

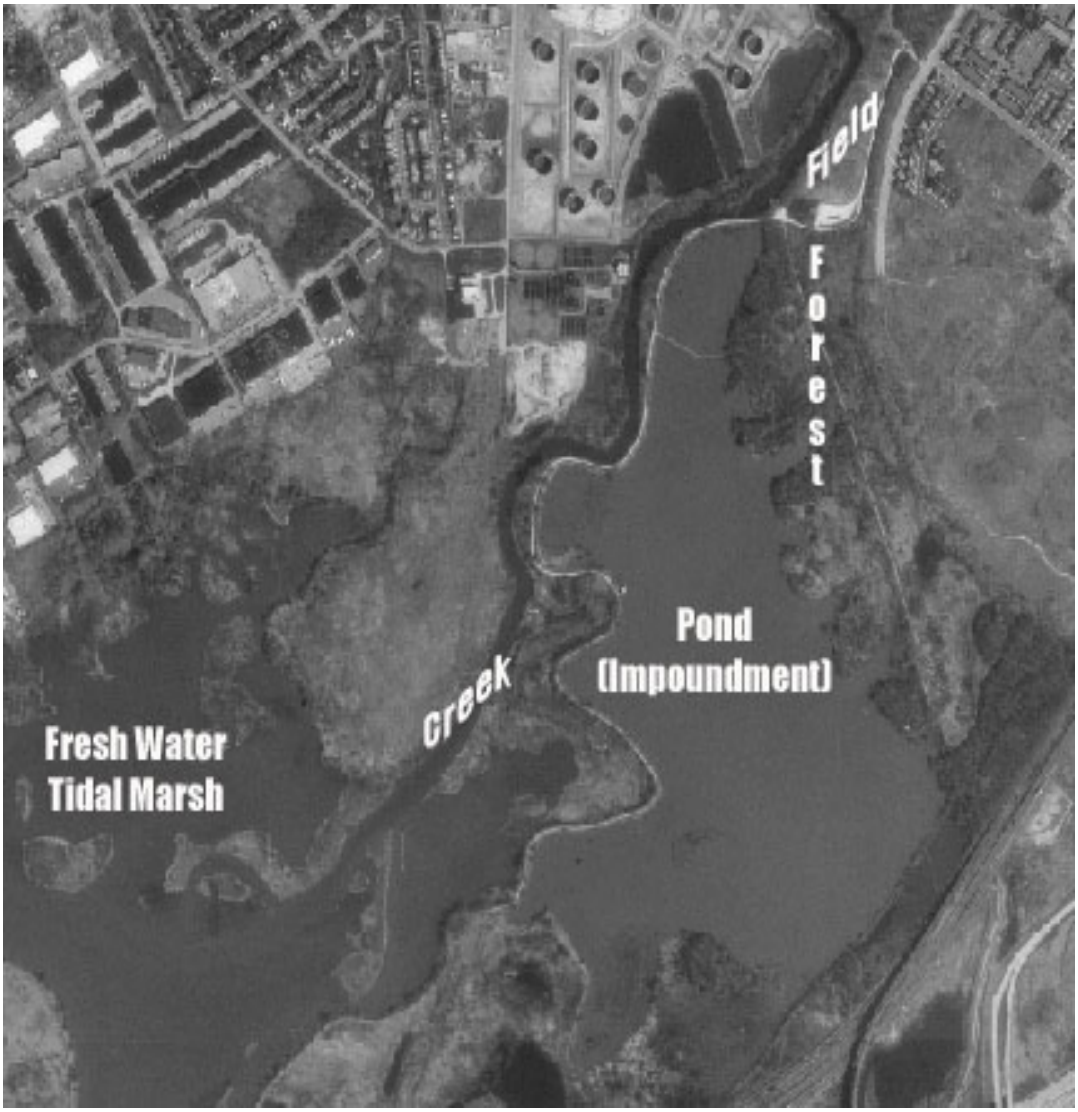
In the wooded areas on the eastern edge of the impoundment, tree crowns of cherry, maple, ash, and white pine allow little light to penetrate. Shrubs and vines include virburnum, poison ivy, blackberry, and wild rose. Woodland animals include deer, squirrels, shrews, raccoons, and a host of songbirds such as robins, warblers, catbirds, and Brown Thrashers.

Fields

The **fields** are mowed every one to three years to prevent successional encroachment by woody plants and introduced species such as phragmites and purple loosestrife. Wildflowers, such as goldenrod, dogbane, and other non-woody plants can be found here. Red-tailed hawks, rabbits, deer, field mice, and foxes, as well as a variety of insects like bees and butterflies, utilize this area. At night, owls search the fields for mice and other rodents.

Wood Frog




Field
Forest
Pond
(Impoundment)
Creek
Fresh Water
Tidal Marsh

Gray Squirrel

Tinicum's Top Ten

Concept

Students discuss biodiversity as an indicator of a healthy environment through identification of a habitat and its association with wildlife.

Objectives

By the end of the activity, the students will:

1. enhance their observation skills
2. be able to describe the variety of wildlife found at the refuge

Pennsylvania Educational Standards

(Environment and Ecology)

4.3.7 B & C

4.3.10 C

4.7.4 A

4.7.7 A & C

4.7.10 A & C

4.7.12 C

Pre-Trip Lesson

1. Practice observation skills around your school. You may want to try the following activities for sight and sound.

   Sight - Lay out a number if items. Allow the students to study them for a few minutes; then cover. Ask the students to individually list those they remember. To make it harder, have the students draw each item in its position within the group.

   Sound - Obtain an even number of opaque film canisters or similar containers. Make pairs of similar sounding canisters by placing various objects inside (screws, nuts, staples, pieces of wood). Distribute canisters to the students. Have them try to find a "mate" by rattling their canisters.

Trip Lesson

1. Select one of the following charts and make copies for your students. Either chart could be tied into what students are currently studying.
2. As the students walk around the refuge, have them attempt to complete the chart. You may want to have them sit quietly and observe for three minutes in various areas along the trail. (Beware of poison ivy and stinging nettle).

Post-trip lesson

1. Review what was observed. Discuss connections between the items. Relate them to the topic that is currently being studied in class or to what they might find around their school.

TINICUM'S TOP TEN

Team: _____

See if you can list at least ten different species for each category. On your trip out to the refuge, you will have to find proof that the organisms listed here actually live in or visit the refuge.

TREES	PLANTS	INSECTS	BIRDS	MAMMALS	FISH	REPTILES	AMPHIBIANS

Tinicum's Top Ten

Team _____, you have been assigned the responsibility of finding ten of the organisms on your list. Look on the trails and in the building. Find the actual organism or evidence that the organism lives in or visits the refuge. Check the boxes indicating where the organism lives in or visits the refuge.

ORGANISM	FOREST	CREEK	FIELD	TIDAL MARSH	IMPOUNDMENT	NOTES

Team-mates names:

Aster spp.

Habitat Hike

Pre-trip Lesson

Concept

Students will use their senses to observe and identify habitats and their specific organisms.

Objectives

Students will be able to:

1. define “habitat” and describe their own habitat.
2. discover the five habitats of the refuge and their characteristics.
3. demonstrate good observation skills through sight, sound, touch, and smell.
4. explore the different habitats which may be unfamiliar.

Pennsylvania Educational Standards

(Environment & Ecology)

4.1.4 - A, C, & D

4.7.4 -A

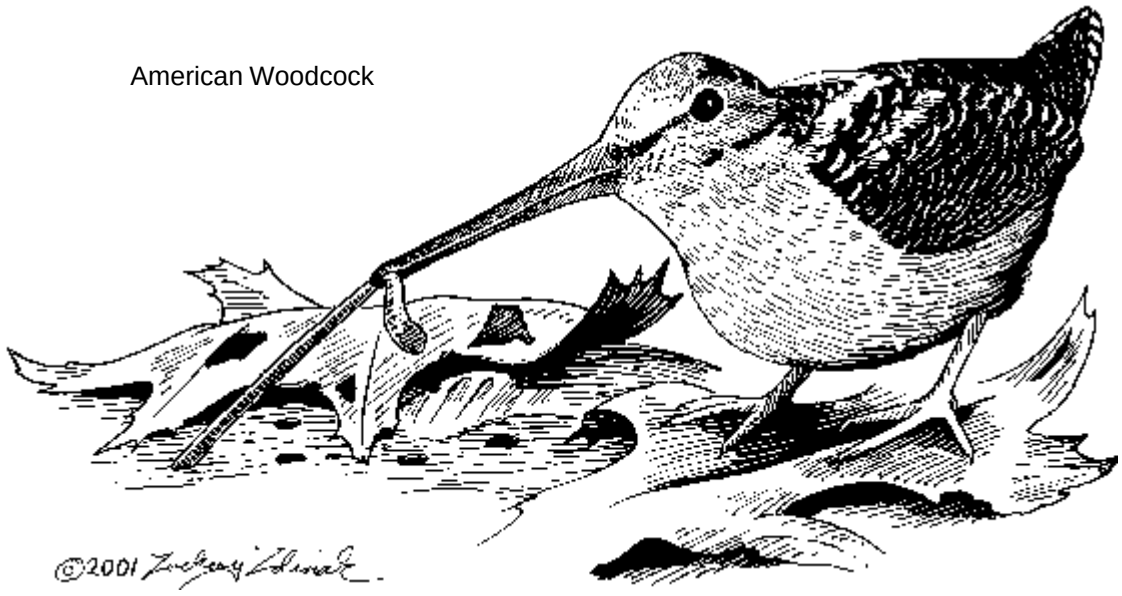
1. What is a **habitat**? A **habitat** is where an organism can obtain food, water, shelter, and space. What is the habitat of the students? Have the students draw their habitats. Use their drawings to help the students decide what animals and plants require in their habitats.
2. Discuss the upcoming trip to the **refuge**. Have the students brainstorm a list of rules to follow while at the refuge, such as being quiet so they can see more, not littering, etc.
3. Discuss with students how they get to know about their **environment** using their **senses**. What are **senses**? *Seeing, hearing, smelling, touching and tasting.**
4. Have students practice a “Quiet Sit” in or around their school. A “Quiet Sit” is an activity in which particpants practice using their senses for a short period of time. Pair the students up in the chosen location. Instruct them to record their observations using their senses. They are not allowed to talk during this activitiy. After two minutes, have the students share their observations and record the data. Which senses generated most of the observations? Was what they observed **natural** or created by people?

*Due to potential allergies or other medical issues, students should not touch or taste anything found at the refuge.

Trip Lesson

1. Lead the students through several of the habitats. Refer to the map and habitat description pages.
2. In each habitat do the following:
    a. Explore the area with your students with the “Quiet Sit” activity they completed at school. Inform the students that they will complete another “Quiet Sit” in this location and will record observations. After two minutes gather the students.
    b. Discuss their observations.
        1. What did they see, hear, and smell?
        2. Were the sounds they heard natural or man-made? What about things they saw or smelled?
        3. Could the organisms that live in this habitat live somewhere else?
        4. What kind of organisms would they expect to see in this habitat?
        5. How are the habitats the same? How are they different?

American Woodcock



Post-trip Lesson

1. Compile a list of observations students made while performing the “Quiet Sit” at the refuge. Compare that list to the one generated at their school. Are there similar sights, sounds, and smells? Are there differences?

2. Have the students compare the two lists. What items observed were natural vs. man-made? Which list has more sights, sounds, or smells that are natural? Made by people?

3. Have the students write a short story on a day in the life of one of the plants or animals seen at the refuge. Include how each utilizes its habitat. You may wish to have students research their animal or plant first to find out more on its life history.

4. Students could develop a “nature trail” in a school hallway or classroom depicting the five habitats seen at the refuge. The nature trail should include various plants and animals seen while visiting the refuge.

5. Have the students personalize their experience through journal writings or by making a collage demonstrating their experience.

6. Have the students take a walk outside the school building. Are there places where the students could improve the habitat for plants and animals?

Short-tailed Shrew

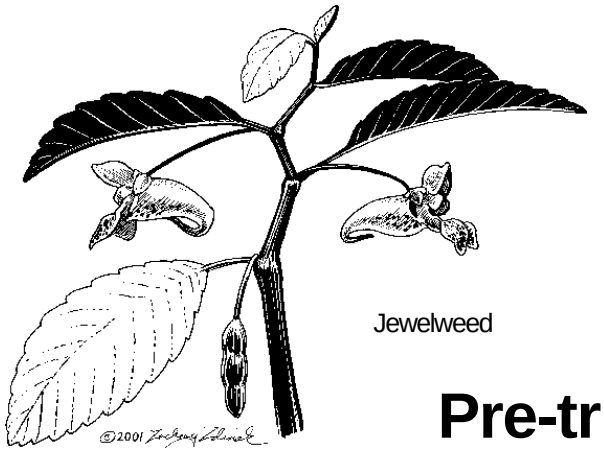
Habitat Hike

Define the word “habitat”.

How many habitats are here at the refuge? List them below.

Which habitat type are you studying?

What did you see/hear/smell?



Jewelwood

Beasts, Blossoms, and Abiotics

Pre-trip Lesson

Concept

Students will understand the biotic and abiotic components of an ecosystem.

Objectives

Students will be able to:

1. describe the five different habitats of the refuge.
2. compare and contrast life forms and the physical characteristics of each habitat.
3. explore five different components that make up an ecosystem (sunlight, soil, water, plants, and animals).

Pennsylvania Educational Standards

(Environment & Ecology)

4.3.4 - A & C

4.6.4 - A

4.6.7 -A

4.6.10 - A

1. Learn about **soil** particle size, types of soil, soil layers, water in the soil, and how soil and water affect plants.

2. Check soil, water, sun, plants, and animals at different parts of your schoolyard, using the data sheet in the appendix and questions you will use during the trip. Describe the area studied. How do these areas compare to each other?

3. Be sure students are familiar with the glossary words so that they can use the field guides.

4. Discuss some of the animals found in your area. What signs do they leave when they utilize an area? In small groups, make up a story about an encounter between two or more animals found in your schooyard. Draw a picture of the evidence that their encounter might leave behind.

5. It is recommended that you copy the Habitat Data Sheet for use with each habitat that you visit.

Trip Lesson

1. Put students into teams of four or five. Give each student a copy of the data sheet.
2. Distribute equipment* to the team. Instruct the students that each team will be responsible for gathering and recording the data. Equipment should rotate among the team members in each habitat. In each habitat, study the following biotic and abiotic factors by completing the activities and recording the observation on the worksheet.

Soil Activities

1. Hang the air thermometer on a branch and insert the soil thermometer in the ground. Do not disturb for three minutes. Record temperatures.
2. Dig up a small sample of soil using the trowel. Describe the soil using your senses. How does the soil smell? What color is it? Is it wet or dry? Pinch some soil between your fingers. Is it gritty or smooth? Return the soil when the students are done investigating it.
3. Are there any indications that animals have been through the area lately? Tracks, scat, holes, etc.?

Water Activities

1. Is there standing water? Was it the result of recent precipitation? If not, what is its source? Place the air/water thermometer in the water and record the temperature. Use a meter stick to measure the depth.
2. Describe the water using your senses. Is it clear? Can you see the ground below? Are there plants growing in or under the water? What color is the water? Does it have a smell?

Sun Activities

1. Measure the temperature of soil in the shade and in the sun using the soil thermometers.
2. Hold air thermometers at waist level, one in a shaded area and one in the sun.

3. Record evidence of plants or animals responding to shade or sunlight. Are plants reaching for the sunlight? Have animals used a clearing for rest?

Plant and Animal Activities

1. Survey the area. Select five common plants and identify them using the field guides. Describe them in terms of the criteria on the data sheet.
2. Did you see any animals when you first entered the area? Look closely: do you see any insects? Is there any evidence that large animls were in the area, such as **scat**, **tracks**, **plant browse**, burrows in the ground or trails, etc.? Enter your observations on the data sheet.

***Teachers may supply equipment or use equipment provided by the refuge. Contact the education staff for more information.**

Post-trip Lesson

1. Using the data collected, compare the habitats investigated today. For example, how are wetland habitats different from upland habitats? How is each habitat type unique? How is each habitat type like another? What are the interactions between the biotic and abiotic components in these habitats?

2. How do the areas studied in your schoolyard compare to the areas studied at the refuge? Is there a habitat found at the refuge that is similar to the schoolyard?

3. Using the generated list of plants and animals found at the refuge, have each student select one and research it. What is its life history? Is it native to the area?

4. Use Post-trips 2 and 3 to create a list of plants and animals that may be able to live near the school. Research them to be sure they are native. Use this list as the basis for a schoolyard habitat.

5 Habitats - “Beasts, Blossoms, and Abiotics” Data Sheet

Habitat Type_____ Name & Date _____

Soil Warm or cool? Temperature reading? How wet? Sandy or smooth? How does it smell?	
Water Is there standing water? Is it clear? What is the temperature? How deep is the water? Does it have a smell?	
Sun What evidence is there of plants or animals responding to sulight or shade?	
Plants Find and describe five common plants in the area.	
Animals Did you find any evidence of animals using the area? Sun or shade areas?	

Resources for Teachers

Some of these resources may be found in the refuge's library.

Field Guides

Butterflies Through Binoculars: A Field Guide to Butterflies in the Boston - New York - Washington Region. Jeffery Glassberg. Oxford University Press, New York, NY., 1993

Mammals of Pennsylvania. J. Kenneth Doutt, Caroline A. Heppenstall, & John E. Guilday. Pennsylvania Game Commission. 1998

Newcomb's Wildflower Guide. Lawrence Newcomb. Little, Brown, and Co., Boston, MA., 1977

Pennsylvania Amphibians & Reptiles. Larry L. Shaffer. Pennsylvania Fish and Boat Commission. 1991

Pennsylvania Fishes. Linda Steiner. Pennsylvania Fish & Boat Commission. 2001

Peterson Field Guide Series - Eastern Birds. Roger Tory Peterson. Houghton Mifflin Co., New York, NY., 1980

Peterson Field Guide Series - Insects: America north of Mexico. Donald J. Borror & Richard E. White. Houghton Mifflin Co., New York, NY., 1970

Peterson Field Guide Series - Trees and Shrubs. George A. Petrides & Roger Tory Peterson. Houghton Miffin Co., New York, NY., 1972

Peterson Field Guide Series - Wildflowers: Northeastern and Northcentral North America. Roger Tory Peterson & Margaret McKenny. Houghton Mifflin Co., New York, NY., 1968

Reference Books and Guides

Greening School Grounds: Creating Habitats for Learning. Tim Grant & Gail Littlejohn. Green Teacher & New Society Publishers, 2001

Guide to Gardening for Life in Southeastern Pennsylvania: Challenges and Champions. Audubon at Home, Bucks County Audubon.

National Wildlife Federation Schoolyard Habitats: A How-to Guide for K - 12 School Communities. National Wildlife Federation, 2001

100 Easy-to-Grow Native Plants for American Gardens in Temperate Zones. Lorraine Johnson. Firefly books Ltd., 1999

Plants in Wetlands: Redington Field Guides to Biological Interactions. Charles B. Redington. Kendall/Hunt Publishing Co., Dubuque, IO., 1994

Pond and Brook: A Guide to Nature in Freshwater Environments. Michael J. Caduto. University Press of New England, 1990

Soil Science Simplified, fourth edition. Helmut Kohnke & D.P. Franzmeier. Waveland Press, Inc., 1995

The Book of Swamp and Bog: Trees, Shrubs, and Wildflowers of Eastern Freshwater Wetlands. John Eastman. Stackpole Books, 1995

The Book of Forest and Thicket: Trees, Shrubs, and Wildflowers of Eastern North America. John Eastman. Stackpole Books, 1992

Additional Readings

All About Deer. Jim Arnosky,Scholastic, Inc.1996

I See Animals Hiding. Jim Arnosky, Scholastic, Inc. 1995

Lost in the Woods. Carl R. Sams II & Jean Stoick, 2004

Shelterwood. Susan Hand Shetterly, Tilbury House Publishers, 1999

Stranger in the Woods. Carl R. Sams II & Jean Stoick, 2000

The Lorax. Dr. Suess, Random House, 1971

Where Butterflies Grow. Joanne Ryder & Lynne Cherry, Lodestar Books,1989.

Websites

www.nwf.org- National Wildlife Federation

www.pgc.state.pa.us - Pennsylvania Game Commission

www.fish.state.pa.us - Pennsylvania Fish and Boat Commission

www.dcnr.state.pa.us - Pennsylvania Department of Conservation and Natural Resources

www.fws.gov - United States Fish and Wildlife Service

Glossary

Abiotic - a non-living factor in the environment

Aquifer - a subsurface formation containing permeable, saturated material that holds a usable supply of water

Biomass - the total amount of living material in a unit of area

Biotic - a living factor in the environment

Burrows - underground living areas for animals

Clay - a fine-grained soil in which the particles are smaller than .002 mm in diameter

Creek - a shallow tributary to a river

Decompostion - the breaking down of organic matter into its inorganic parts

Ecosystem - the living and nonliving parts of a natural unit which are connected through various natural cycles and energy flows.

Energy - usable heat and light in the environment

Environment - all external factors influencing the growth and development of organisms

Estuary - the lower course of a river where it is met by ocean tides

Fauna - animals

Field - an area of land characterized by soft-stemmed (herbaceous) plants

Flora- plants

Forest - a dense growth of trees in a large area

Habitat - where an organism lives that includes the basic needs for survival - food, water, shelter, and space

Herbaceous - non-woody plant. Green, leaflike in appearance

Impoundment - a body of water created by diking

Loam - a soil consisting of sand, silt, and clay

Man-made - produced or created by man

Marsh - an area of low lying wetland characterized by soft-stemmed herbaceous plants

Migration - the act of traveling distances in seasonal movements

Natural - produced by nature

Racoon

Niche - where and how a particular organism interacts with its habitat and other wildlife, this may include food preferences, shelter needs, and time of highest activity

Observation - the act of noting or recording something without judgement or speculation

Organism - a plant or animal

Plant Browse - evidence of an animal feeding on a plant. Ex. cleanly nipped buds, holes in leaves

Pond - generally a small, shallow body of water with a uniform temperature throughout the water column

Refuge - a managed area of land designated specifically for wildlife use

Sand - loose, granular particles of disintegrated rock, smaller than gravel but larger than dust. Sand particles are typically 2.0 - .05 mm in diameter

Scat - animal droppings; fecal matter

Senses - Seeing, hearing, smelling, tasting, touching

Silt - a sedimentary material composed of fine mineral particles smaller than sand but larger than clay, .05 - .002 mm in diameter

Shelter - something which provides cover or protection

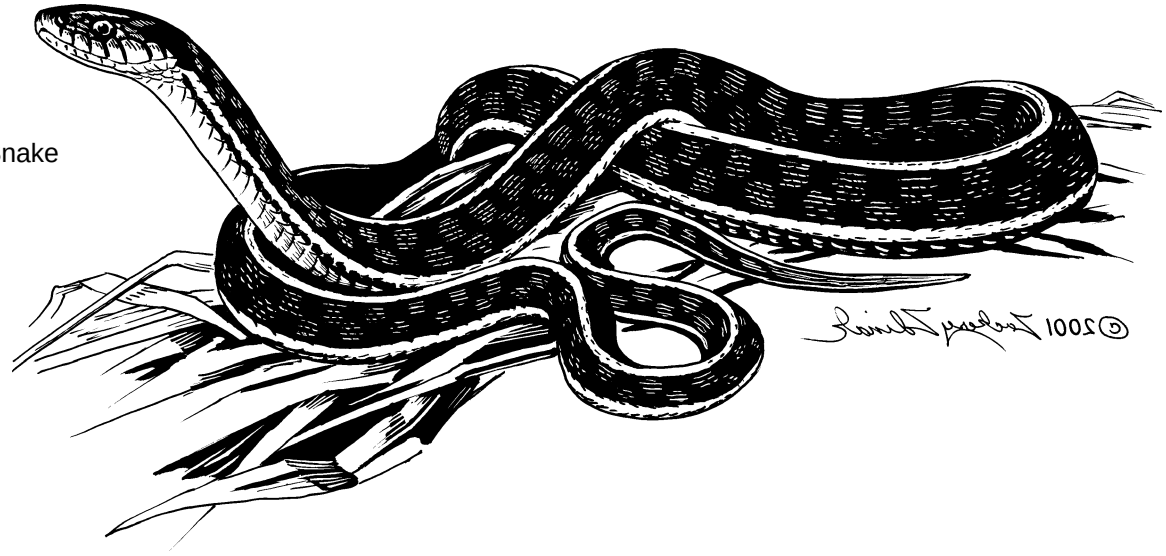
Soil- the top layer of the earth suitable for growing plants

Tracks - prints left behind by animals

Wetland - land which is saturated with water at least part of the year, typically dominated by plants preferring saturated soil conditions

Woodland - land covered by trees and shrubs

Woody - tree-like



Garter Snake

U.S. Fish & Wildlife Service
http://www.fws.gov

July 2001